

The applicants hereby respectfully traverse the restriction requirements communicated by the Examiner on May 10, 2007.

Summary of the Traversal

In summary, applicants respectfully submit that the inventions of Groups I, II, III and IV are related. Group I inventions (claims 6-11, 14, 35-38 and 81-82) are linkage studies using an association based linkage test, i.e. processes for identifying markers. (A linkage study is a study that identifies markers that are **linked** to a trait-causing polymorphism.) Group III inventions (claims 39-43, 56-60, and 61-67) are processes that provide the genotype data/sample allele frequency data for the processes (inventions) of Group I, specifically for act d) of the Group I processes. Group III inventions are therefore processes that are part of the Group I processes. Group IV inventions (claims 44-54 and 86-88) are apparatus for practicing the (process) inventions of Group III. And Group II inventions (claims 16-19, 21, 24, 26-34, 68-80 and 90) are the oligonucleotides that are attached to Group IV inventions (i.e., part of the structure of Group IV inventions).

In summary, the applicants also respectfully submit that the claimed inventions do not represent divergent subject matter. All of the claimed inventions are directed to inventions in the field of **linkage studies**. This is the reason the title of the invention is **Two-dimensional linkage study methods and related inventions**. **In addition, all of the claimed inventions are based on the inventor's discovery of a result effective variable (MPEP 2144.05 II B discusses result effective variables).** The result effective variable and principle (of the similarity of marker allele frequency and possible trait-causing polymorphism allele frequency increasing the power of association-based linkage tests) was discovered by the inventor and was unrecognized by conventional one-dimensional techniques; see, for example, application paragraphs [0308], [0285] and [0019].

The use of this result effective variable in the design, description and claiming of the invention leads to the **novel two-dimensional linkage study approach** (see paragraphs [0034] to [0037], [0040] to [0042] and [0046] to [0052]). **And this novel two-dimensional linkage study approach leads to a limitation that is present in all the claims.** That limitation is *“two or more bi-allelic covering markers so that a CL-F region is systematically covered by the two or more covering markers”*. Each of the independent claims in the presently pending claim set contain this same limitation and each such claim defines a **two-dimensional linkage study technique**.

In summary, each claimed invention is a two-dimensional linkage study technique; and the claimed inventions do not represent divergent subject matter. The applicants therefore respectfully submit that the reasons a) through e) (given by the Examiner in the Communication of May 10, 2007) for a serious search and examination burden if restriction were not required are unreasonable.

More detailed arguments/reasons regarding the applicants' traversal of the restriction requirement of May 10, 2007 now follow.

The Examiner states (on page 2): *“The inventions of Groups I and III are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together...”*.

The applicants respectfully submit that the inventions of Groups I and III are related and disclosed in the application as capable of use together. More specifically the claimed processes or inventions of Group III practice part of the claimed processes or inventions of Group I. Specifically the processes (inventions) of Group III are part of act d) of the processes (inventions) of Group I.

This practice of part of act d) of Group I processes by Group III processes is described in paragraph [0231] of the application. Paragraph [0231] states: *"A process to obtain genotype data/sample allele frequency data similar to the data of the d) of process #1 has great utility in that it is used to provide genotype data/sample allele frequency data for the more powerful two-dimensional linkage studies introduced in this application."* The application then goes on to describe the inventions of Group III in paragraphs [0232] to [0243]. Specifically, the inventions of Group III provide the genotype data/sample allele frequency data for act d) of the Group I inventions. **Applicants respectfully submit that since the inventions of Group III are part of the process of Group I inventions, the inventions of Groups I and III are related.**

Applicants respectfully submit that the MPEP essentially indicates that if a first invention is used to practice part of a second invention, then the first and second inventions are related. Specifically MPEP 802.01 states: "The term "independent" (i.e., ~~unrelated~~) means that there is no disclosed relationship between the two or more inventions claimed, See also MPEP 806.06.. " And MPEP 806.06 states: "Inventions as claimed are independent if there is no disclosed relationship between the inventions,... For example:

(A) Two different combinations, not disclosed as capable of use together, having different modes of operation, different functions and different effects are independent. An article of apparel and a locomotive bearing would be an example. A process of painting a house and a process of boring a well would be a second example.

(B) Where the two inventions are process and apparatus, and the apparatus cannot be used to practice the process or any part thereof, they are independent. A specific process of molding is independent from a molding apparatus that cannot be used to practice the specific process."

Again, the applicants respectfully submit that the invention of Groups I and III are related and disclosed in the application as capable of use together. And the applicants respectfully submit that the invention of Groups I and III are not "unrelated" (or "independent") in the sense described in MPEP 802.01 and MPEP 806.06 above.

The Examiner states (p. 3 first paragraph): *"The invention of Groups I, II and IV are unrelated."* The applicants respectfully disagree with this statement. **The apparatus inventions of Group IV are disclosed as used to practice part of act d) of the processes (inventions) of Group I.** More specifically paragraph [0215] states: *"An apparatus to obtain genotype data/sample allele frequency data similar to the data of the d) of process #1 has great utility in that it is used to provide genotype data /sample allele frequency data for the more powerful two-dimensional linkage studies introduced in this application."* The application then goes on to describe the inventions of Group IV in more detail in paragraphs [0216] to [0229].

An apparatus for obtaining genotype data as in claim 44 of Group IV is *"an apparatus to obtain genotype data/sample allele frequency data"* as described in paragraph [0215]. **MPEP 806.06 (B) states:** *"Where the two inventions are process and apparatus, and the apparatus cannot be used to practice the process or any part thereof, they are independent."* The applicants respectfully submit that the invention(s) of Groups I and IV are clearly not "unrelated" (or "independent") in the sense described in MPEP 806.06 (B) above. And the applicants respectfully submit that the invention(s) of Groups I and IV are related.

The Examiner states (p. 3 first paragraph): *"neither Group I nor Group IV specifically requires the oligonucleotides of Group II"*. The applicants respectfully disagree with this statement. **The apparatus of Group IV do require the oligonucleotides of Group II.** Claim 44 of Group IV reads in part: *"wherein copies of a set of oligonucleotides that is complementary to the group of two or more bi-allelic covering markers are attached to the apparatus"*. (Claim 44 also reads: *"wherein the group of covering markers systematically cover a CL-F region"*). These attached complementary oligonucleotides of Group IV are the same complementary oligonucleotides of Group II, claim 16.

Thus the applicants respectfully submit that the inventions of Groups II and IV are related; and the inventions of Group I and IV are also related. **And the applicants also respectfully submit that the inventions of Groups I, II and IV are therefore also related.**

In the second paragraph of page 3 the Examiner states correctly that the Group III and IV inventions are related. For the above reasons, the inventions of Groups I, II, III and IV are related. **In summary, applicants respectfully submit that the inventions of Groups I, II, III and IV are related.** Group I inventions are linkage studies using an association based linkage test, i.e. processes for identifying markers. (A linkage study is a study that identifies markers that are linked to a trait-causing polymorphism.) Group III inventions are processes that provide the genotype data/sample allele frequency data for the processes (inventions) of Group I, specifically part of the data act d) of Group I inventions. Group IV inventions are apparatus for practicing the (process) inventions of Group III. And Group II inventions are the oligonucleotides that are attached to Group IV inventions (i.e., part of the structure of Group IV inventions).

In the second paragraph of page 3 the Examiner also argues that the inventions of Groups III and IV are distinct. The applicants respectfully disagree with the specifics of the Examiner's argument in the following respect. **The Examiner specifically states that:** *"(2) the system as claimed can be used to practice another materially different process (MPEP 806.05(e)). In this case the computer system for analyzing a plurality of transcripts in a plurality of samples of Group IV does not comprise any limiting hardware or software devices. Therefore the apparatus of Group IV could be used in any number of materially different processes, such as automated nucleic acid sequencing or microarray quality control analysis, respectively."*

The applicants respectfully submit that there is no computer system (limited or otherwise) recited in the claims of Group IV. The apparatus of Group IV is not a computer system, but is an apparatus for obtaining genotype data at markers for use in linkage studies. Claim 44 reads in part: *"An apparatus for obtaining genotype data for each bi-allelic marker of a group of two or more bi-allelic covering markers....., wherein the group of covering markers systematically cover a CL-F region....."*. The apparatus is thus limited by a group of markers that systematically cover a CL-F region. The processes of Group III are also limited by the same limitation of *"a group of two or more bi-allelic covering markers....., wherein the group of covering markers systematically cover a CL-F region"* (see claim 39). Because of this limitation, the applicants respectfully submit that the apparatus cannot be used to practice another and materially different process than the processes of Group III.

Traversal of Examiner's Argument of Serious Search and Examination Burden

The Examiner states (last paragraph p. 3) that *"there would be a serious search and examination burden if restriction were not required.."*. The applicants respectfully disagree with this statement for the following reasons.

The applicants respectfully submit that the claimed inventions do not represent divergent subject matter. All of the claimed inventions are directed to inventions in the field of linkage studies. This is the reason the title of the invention is Two-dimensional linkage study methods and related inventions. Group I inventions (claims 6-11, 14, 35-38 and 81-82) are linkage studies using an association based linkage test, i.e. processes for identifying markers. (A linkage study is a study that identifies markers that are linked to a trait-causing polymorphism.) Group III inventions (claims 39-43, 56-60, and 61-67) are processes that provide the genotype data/sample allele frequency data for the processes (inventions) of Group I, specifically for act d) of the Group I processes. Group III inventions are therefore processes that are part of the Group I processes. Group IV inventions (claims 44-54 and 86-88) are apparatus for practicing the (process) inventions of Group III. And Group II inventions (claims 16-19, 21, 24, 26-34, 68-80 and 90) are the oligonucleotides that are attached to Group IV inventions (i.e., part of the structure of Group IV inventions).

In addition, all of the claimed inventions are based on the inventor's discovery of a **result effective variable (MPEP 2144.05 II B discusses result effective variables)**. The result effective variable that was newly discovered by the inventor is (the principle) that the similarity of marker allele frequency and possible trait-causing polymorphism allele frequency increases the power of association-based linkage tests. This is discussed in the second and third paragraphs of p. 20 of the RCE and Amendment/Response of February 2007. The result effective variable and above principle (of the similarity of marker allele frequency and possible trait-causing polymorphism allele frequency increasing the power of association-based linkage tests) was discovered by the inventor and was unrecognized by conventional techniques; see, for example, application paragraphs [0308] and top [0285]. The principle was, for example, unrecognized at the time of the conventional, essentially one-dimensional TDT association study of Risch and Merikangas in September of 1996, see [0027]. There is nothing mentioned about the principle in the Risch and Merikangas reference or in the Kruglyak reference [0026] (Nature Genetics September 1997).

The use of this result effective variable in the design, description and claiming of the invention leads to the **two-dimensional linkage study approach** (see paragraphs [0034] to [0037], [0040] to [0042] and [0046] to [0052]). And the **two-dimensional linkage study approach leads to a limitation that is present in all the claims**. That limitation is *"two or more bi-allelic covering markers so that a CL-F region is systematically covered by the two or more covering markers"*. Each of the independent claims in the presently pending claim set contain this limitation. **Because each pending claim includes the same limitation, the applicants respectfully submit that the claims are not directed to divergent subject matter. In summary, each claimed invention is a two-dimensional linkage study technique; and the claimed inventions do not represent divergent subject matter.**

The applicants respectfully submit that the reasons given for a serious search and examination burden if restriction were not required are unreasonable.

The Examiner has given reasons a) through e) (bottom p. 3 & top page 4 of the Restriction Requirement Communication of May 10, 2007) of a serious search and examination burden if there is no restriction. But as stated above the claimed inventions do not represent divergent subject matter and the applicants therefore respectfully submit that the reasons given for a serious search and examination burden if restriction were not required are unreasonable.

Regarding reason (a), *"(a) the inventionshave different classification"*, the applicants respectfully note that the Examiner has stated (p. 2 of the Communication of 5/10/07) that each of the Groups I-IV has the same classification. That same classification is class 702, subclass 019.

Reason (d), *"(d) the prior art applicable to one invention will not likely be applicable to another invention"*, is unreasonable for the following reasons. As stated above, each claim contains the same limitation, that limitation is based on a result effective variable that was discovered by the inventor. Each claim thus defines a "two-dimensional linkage study technique" (see application paragraphs [0034], [0035], and [0040] to [0042]). This two-dimensional linkage study approach is novel and is based on a result effective variable that was discovered by the inventor. Because each claim defines a two-dimensional linkage study technique, the applicants respectfully submit that the prior art applicable to one invention will in fact likely be applicable to another invention.

Similarly, since each claim defines a two-dimensional linkage study technique, the claimed inventions have not acquired a separate status in the art and do not require a separate field of search. Thus reasons (b) and (c) supporting a serious search and examination burden are also unreasonable.

In addition the applicants respectfully submit that there is no evidence to support reason (e), *"(e) the inventions are likely to raise different non-prior art issues under 35 USC 101 and/or 35 USC 112, first paragraph"*. The applicants also respectfully note that the inventions of Groups I-IV have undergone much previous examination by the USPTO and reason (e) has not been raised before.

For the arguments and reasons advanced above, the applicants respectfully request that the Examiner withdraw the Restriction Requirement. The foregoing traversal arguments made by the applicants does not constitute an admission that the presently pending claims 6-88 recite the same invention or that the presently pending claims 6-88 stand and fall together.

Election of an invention to be examined and identification of the claims encompassing the elected invention.

In the Communication of May 10, 2007 the Examiner advised the applicants that (i) an election of an invention to be examined and (ii) identification of the claims encompassing the elected invention is required even if the applicants traverse the restriction requirement; see top p. 4. The applicants have traversed the restriction requirement above by specifically and respectfully pointing out the errors in the restriction requirement.

The applicants hereby elect Group II (claims 16-19, 21, 24, 26-34, 68-80, 89 and 90) to be examined. The applicants also respectfully note that (as indicated above in the traversal), the Group II inventions are the oligonucleotides that are attached to Group IV inventions (i.e., part of the structure of Group IV inventions). **And for this reason the applicants respectfully submit that the Group II and IV inventions are clearly not independent and distinct.** The applicants plan to submit a new or amended claim set soon in a Supplemental Amendment/Response. The new or amended claim set will make clear the relationship between the oligonucleotides of Group II and other claims in the set. **And the new or amended claim set will also indicate which nonelected claims the applicants believe are eligible for rejoinder should the Examiner make the restriction requirement final.**

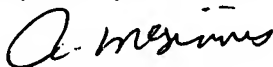
Conclusion

The applicants have elected Group II inventions to be examined. The election has been made with traversal of the restriction requirement of May 10, 2007. The traversal has specifically and respectfully indicated the errors in the restriction requirement by showing that the inventions of Groups I-IV are related and are not divergent subject matter. Because of this lack of divergence, the applicants respectfully submit that there is no serious search and examination burden if restriction is not required.

The applicants have also respectfully noted that the Group II inventions are the oligonucleotides that are attached to Group IV inventions (i.e., part of the structure of Group IV inventions). **And the applicants have respectfully submitted that the Group II and IV inventions are therefore clearly not independent and distinct.** The applicants plan to submit a new or amended claim set soon in a Supplemental Amendment/Response. The new or amended claim set will make clear the relationship between the oligonucleotides of elected Group II and other claims in the set. **And the new or amended claim set will also indicate which nonelected claims the applicants believe are eligible for rejoinder should the Examiner make the restriction requirement final.**

An appropriate small entity fees for a two-month extension is enclosed.

Respectfully submitted,



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Re: Application No.: 10/037,718

Mailing Certificate

The following items were deposited by me, Robert McGinnis, on August 10, 2007 in First Class US Mail with sufficient postage for delivery. The items were all placed in an envelope addressed to: **Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

The items were as follows:

1) Response to Restriction Requirement (total of 12 pages, signed) for **Application No.: 10/037,718**, Filed: 01/04/2002, Title of the Invention: TWO-DIMENSIONAL LINKAGE STUDY METHODS AND RELATED INVENTIONS, inventors MCGINNIS.

2) PTO Credit Card Form PTO-2038 (1 page signed) with fee for two-month extension for a small entity, \$225.

3) This Mailing Certificate (1 page signed)

Total pages: 14

4) Two return receipt post cards.

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